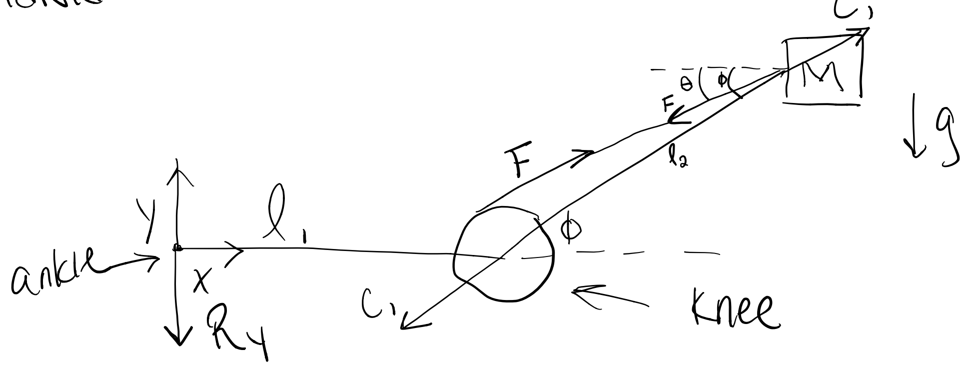
Individual Deliverable

Riley Ennis



$$M\ddot{x}_a = C_1\cos\phi - F\cos\theta$$

$$M\ddot{y}_a = C_1\sin\phi - F\sin\theta - Mg$$

$$C_1\cos\phi = F\cos\theta - M\ddot{x}_a \longrightarrow C_1 = F\frac{\cos\theta}{\cos\phi} - \frac{M\ddot{x}_a}{\cos\phi}$$

$$M\ddot{y}_a = \left(\frac{F\cos\theta}{\cos\phi} - \frac{M\ddot{x}_a}{\cos\phi}\right)\sin\phi - F\sin\theta - Mg$$

$$M\ddot{y}_a = \frac{F\cos\theta}{\cos\phi}\sin\phi - \frac{M\ddot{x}_a}{\cos\phi}\sin\phi - F\sin\theta - Mg$$

$$y_a = l_2\sin\phi \qquad x_a = l_1 + l_2\cos\phi$$

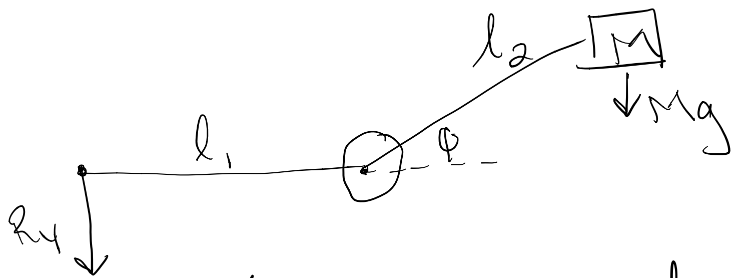
$$\dot{y}_a = (l_2\cos\phi)\dot{\phi} \qquad \dot{x}_a = (-l_2\sin\phi)\dot{\phi}$$

$$\ddot{y}_a = (-l_2\sin\phi)\dot{\phi}^2 \qquad \ddot{x}_a = (-l_2\cos\phi)\dot{\phi}^2$$

$$\boxed{-Ml_2\sin\phi\,\dot{\phi}^2 = F\cos\theta\tan\phi + Ml_2\sin\phi\,\dot{\phi}^2 - F\sin\theta - Mg}$$

F is force exerted by hamstring

This is a highly simplified model assuming hip angle is 180°.



$$\sum M_{knee} = 0 = R_y l_1 - Mgl_2 \sin\phi$$

$$R_y = \frac{Mgl_2 \sin\phi}{l_1}$$